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Howard Brenner's Legacy for Biological Transport Processes

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This talk discusses the manner in which Howard Brenner's theoretical contributions have had, and long will have, strong and direct impact on the understanding of transport processes occurring in biological systems. His early work on low Reynolds number resistance/mobility coefficients of arbitrarily shaped particles, and particles near walls and in pores, is an essential component of models of hindered diffusion through many types of membranes and tissues, and convective transport in microfluidic diagnostic systems. His seminal contributions to macrotransport (coarse-graining, homogenization) theory presaged the growing discipline of multiscale modeling. For biological systems they represent the key to infusing diffusion models of a wide variety of tissues with a sound basis in their microscopic structure and properties, often over a hierarchy of scales. Both scientific currents are illustrated within the concrete context of diffusion models of drug/chemical diffusion through the skin. This area of theory, which is key to transdermal drug development and risk assessment of chemical exposure, has benefitted very directly from Brenner's contributions. In this as in other areas, Brenner's physicochemical insight, mathematical virtuosity, drive for fully justified analysis free of ad hoc assumptions, quest for generality, and impeccable exposition, have consistently elevated the level of theoretical understanding and presentation. We close with anecdotes showing how his personal qualities and warmth helped to impart high standards of rigor to generations of grateful research students.

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